

Claims

1. A receiver for receiving a multi-carrier transmission, wherein the multi-carrier transmission comprises various symbols, each symbol comprising a plurality of carriers, the receiver comprising:
 - 5 means for accessing at least one symbol which is adapted to establish a distinguishable power based pattern for pilot carriers in the at least one symbol,
means for establishing power accumulation sums for possible pilot carriers of the symbol based on the pattern, and
means for determining a power accumulation sum maximum of the sums indicating
10 a pilot carrier position.
2. A receiver according to claim 1, wherein one of the possible pilot carriers is adapted to comprise the maximum in accordance with the predetermined pattern for the pilot carriers within the symbol.
3. A receiver according to any one of the preceding claims, wherein the position of
15 the possible pilot carriers is adapted to be based on the pattern in such a way that carrier indexes having a pilot in a matrix of certain number of symbols are adapted to be selected, and the corresponding carrier index position within the accessed symbol is accordingly adapted to be selected.
4. A receiver according to any one of the preceding claims, wherein every predetermined carrier of the symbol is adapted to be selected for the means for establishing
20 the power accumulation sums.
5. A receiver according to claim 4, wherein every fourth carrier of the symbol is adapted to be selected for the means for establishing the power accumulation sums.
6. A receiver according to claim 1, wherein the distinguishable power based pattern
25 comprises boosted pilot carriers compared to data carriers of the symbol.
7. A receiver according to claim 6, wherein the pilots are boosted in amplitude of $4/3$ compared to the data carriers.
8. A receiver according to claim 1, wherein the means for establishing power accumulation sums comprises:

means for performing a first power accumulation sum for first possible pilot carrier positions of the symbol,

means for performing a second power accumulation sum for second possible pilot carrier positions of the symbol,

- 5 means for performing a third power accumulation sum for third possible pilot carrier positions of the symbol,

means for performing a fourth power accumulation sum for fourth possible pilot carrier positions of the symbol, and

the means for determining comprises:

- 10 means for detecting the power accumulation maximum magnitude from the first, second, third, and fourth power accumulation sums for indicating the current scattered pilot raster position.

9. A receiver according to claim 8, wherein the first power accumulation sum is adapted to be calculated based on the following formulae:

- 15 $PS_1(n) = \sum_{p=0}^{p_{\max}} S(n, 12p + 12) \cdot S^*(n, 12p + 12)$, wherein $S(n, c)$ denotes c -th subcarrier of the current symbol and p_{\max} depends on the used mode of the transmission.

10. A receiver according to claim 8, wherein the second power accumulation sum is adapted to be calculated based on the following formulae:

- 20 $PS_2(n) = \sum_{p=0}^{p_{\max}} S(n, 12p + 3) \cdot S^*(n, 12p + 3)$, wherein $S(n, c)$ denotes c -th subcarrier of the current symbol and p_{\max} depends on the used mode of the transmission.

11. A receiver according to claim 8, wherein the third power accumulation sum is adapted to be calculated based on the following formulae:

$$PS_3(n) = \sum_{p=0}^{p_{\max}} S(n, 12p + 6) \cdot S^*(n, 12p + 6), \text{ wherein } S(n, c) \text{ denotes } c\text{-th subcarrier of the current symbol and } p_{\max} \text{ depends on the used mode of the transmission.}$$

- 25 12. A receiver according to claim 8, wherein the fourth power accumulation sum is adapted to be calculated based on the following formulae:

$PS_4(n) = \sum_{p=0}^{p_{\max}} S(n, 12p+9) \cdot S^*(n, 12p+9)$, wherein $S(n, c)$ denotes c -th subcarrier of the current symbol and p_{\max} depends on the used mode of the transmission.

13. A receiver according to claim 8, wherein the first power accumulation sum is adapted to be calculated based on the following formulae:

5 $PS_1'(n) = \sum_{p=0}^{p_{\max}} S(n, 12p) \cdot S^*(n, 12p)$, wherein $S(n, c)$ denotes c -th subcarrier of the current symbol and p_{\max} depends on the used mode of the transmission.

14. A receiver according to claim 8, wherein in the means for detecting the power accumulation maximum magnitude is adapted to be based on the following formulae:

10 $PS_{\max}(n) = \max\{PS_p(n)\}, p \in \{1, 2, 3, 4\}$, wherein $PS_p(n)$ denotes the first, second, third, and fourth power accumulation sums, p is adapted to determine pilot carrier positions for identifying a certain symbol, and

the current scattered pilot raster position (SPRP) is adapted to be found based on the following formulae:

15 $SPRP(n) = \arg \max_p \{PS_p(n)\}, p \in \{1, 2, 3, 4\}$, wherein the $PS_p(n)$ denotes the first, second, third, and fourth power accumulation sums, p is adapted to determine pilot carrier positions for identifying a certain symbol.

15. A receiver according to claim 1, wherein the means for accessing comprises:

means for obtaining a first symbol of the transmission,

20 means for obtaining another symbol in relation to the first symbol.

16. A receiver according to claim 15, wherein the accessed symbols comprise currently received symbol and certain predetermined another symbol preceding or following the currently received symbol.

25 17. A receiver according to claim 15, wherein the accessed symbols comprise currently received symbol and certain predetermined another symbol preceding or following the currently received symbol so that the correspondence pattern is adapted to be established between pilot carriers of the symbols for possible carrier positions within the matrix of the symbols.

18. A receiver according to any one of the claims 15 – 17, wherein the certain pre-determined another symbol comprises a consecutive symbol preceding or following the currently received symbol.

19. A receiver according to claim 15, wherein the means for establishing power accumulation sums comprises:

means for establishing power accumulation sums for possible pilot carriers of the first symbol, and the receiver further comprises:

means for establishing another power accumulation sums for possible pilot carriers of the another symbol, and

means for establishing cumulated power sums from the power accumulation sums and the another power accumulated sums,

and the means for determining the power accumulation sum maximum comprises:

means for determining the power accumulation sum maximum of the cumulated power sums for indicating the current pilot carrier position.

20. A receiver according to claim 19, wherein the means for establishing another power accumulation sums comprises:

means for performing a first another power accumulation sum for first possible pilot carrier positions of the another symbol,

means for performing a second another power accumulation sum for second possible pilot carrier positions of the another symbol,

means for performing a third another power accumulation sum for third possible pilot carrier positions of the another symbol,

means for performing a fourth another power accumulation sum for fourth possible pilot carrier positions of the another symbol.

21. A receiver according to claim 19, wherein for the means for establishing cumulated power sums from the power accumulation sums and another power accumulation sums, the respective power accumulation sums of the first and the another symbol are adapted to be selected in such a way that the pilot carriers of the symbols have a correspondence for the respective sums.

22. A receiver according to claim 20, wherein means for establishing cumulated power sums from the power accumulation sums and the another power accumulated sums comprises:

5 means for performing a first cumulated power sum for the first power accumulation sum of the first symbol and the fourth another power accumulation sum of the another symbol,

means for performing a second cumulated power sum for the second power accumulation sum of the first symbol and the first another power accumulation sum of the another symbol,

10 means for performing a third cumulated power sum for the third power accumulation sum of the first symbol and the second another power accumulation sum of the another symbol, and

means for performing a fourth cumulated power sum for the fourth power accumulation sum of the first symbol and the third another power accumulation sum of the
15 another symbol.

23. A receiver according to any one of the preceding claims, wherein the multi-carrier transmission comprises OFDM transmission using time slicing, the symbol comprises OFDM symbol and the plurality of carriers comprise data carriers and scattered pilot carriers.

20 24. A receiver according to any one of the preceding claims, wherein the multi-carrier transmission comprises time slicing based power saving based on bursts, and a synchronization of the receiver into the bursts is adapted to be based on the indicated pilot position for finding index of the received symbol.

25 25. A receiver according to any one of the preceding claims, wherein the multi-carrier transmission comprises DVB transmission using time slicing based on bursts, and synchronization into the bursts is adapted to be based on the indicated pilot position for finding an indication indicating the OFDM symbol.

26. A receiver according to any one of the preceding claims, wherein the receiver further comprises:

30 a Fast Fourier Transform (FFT) means for FFT transformation of the received transmission for obtaining the symbol,

accumulator means for accumulating power accumulation sum results, and

Channel Estimation means (CHE) for further continuing the reception of the transmission.

27. A receiver according to any one of the preceding claims, wherein computational
5 resources for performing the operations of at least one of the means comprises the same computational resources which are adapted to perform a post-FFT acquisition in the receiver.

28. A receiver according to any one of the preceding claims, wherein a buffer means of the receiver is adapted to contain all said means.

10 29. A mobile terminal for receiving a multi-carrier transmission, wherein the multi-carrier transmission comprises various symbols, each symbol comprising a plurality of carriers, the terminal comprising:

means for accessing at least one symbol which is adapted to establish a distinguishable power based pattern for pilot carriers in the at least one symbol,

15 means for establishing power accumulation sums for possible pilot carriers of the symbol based on the pattern, and

means for determining a power accumulation sum maximum of the sums indicating a pilot carrier position.

20 30. A sub-assembly of a terminal for receiving a multi-carrier transmission, wherein the multi-carrier transmission comprises various symbols, each symbol comprising a plurality of carriers, the sub-assembly comprising:

means for accessing at least one symbol which is adapted to establish a distinguishable power based pattern for pilot carriers in the at least one symbol,

25 means for establishing power accumulation sums for possible pilot carriers of the symbol based on the pattern, and

means for determining a power accumulation sum maximum of the sums indicating a pilot carrier position.

31. A chipset for receiving a multi-carrier transmission, wherein the multi-carrier transmission comprises various symbols, each symbol comprising a plurality of carriers,
30 the chipset comprising:

means for accessing at least one symbol which is adapted to establish a distinguishable power based pattern for pilot carriers in the at least one symbol,

means for establishing power accumulation sums for possible pilot carriers of the symbol based on the pattern, and

- 5 means for determining a power accumulation sum maximum of the sums indicating a pilot carrier position.

32. A method for receiving a multi-carrier transmission, wherein the multi-carrier transmission comprises various symbols, each symbol comprising a plurality of carriers, the method having the steps of:

- 10 accessing at least one symbol which is adapted to establish a distinguishable power based pattern for pilot carriers in the at least one symbol,

establishing power accumulation sums for possible pilot carriers of the symbol based on the pattern, and

- 15 determining a power accumulation sum maximum of the sums indicating a pilot carrier position.

33. A computer program comprising computer program code means adapted to perform the steps of claim 32 when said program is run on a computer.

34. A computer program product as claimed in claim 33 embodied on a computer readable medium.